

Eastern Primary Species of Concern

The Primary NNIPS list was developed from current Federal and state data, expert opinion, and plant characteristics. The Primary NNIPS list is for species currently with wide distribution, strong negative ecological impact and current land managers are actively controlling.

Garlic Mustard
Alliaria petiolata

Family: Brassicaceae (USDA, NRCS 2001).

Common Names: Garlic mustard.

Synonyms: *Alliaria alliaria*, *Alliaria officinalis*, *Erysium alliaria*, and *Sisymbrium alliaria* (USDA, NRCS 2001).

USDA Code: ALPE4 (USDA, NRCS 2001).

Legal Status: Not listed.

Identification:

Growth Form: Biennial forb (Rowe and Swearingen 1997).

Flower: Flowers are white and usually occur from April to May. Inflorescence is a raceme, usually terminal but occasionally axillary. Flowers are up to 7 mm in diameter, have four petals 3-6 mm long arranged in the shape of a cross, and 6 stamens: 4 long and 2 short (Nuzzo 2000).



flower (USDA, NRCS 2001)



garlic mustard plant (John M. Randall/TNC)

Seeds/Fruit: Fruit is a silique up to 6 mm long. Seeds are shiny black when mature, cylindrical, and 3 mm long (Rowe and Swearingen 1997 and Nuzzo 2000).

Leaves: Rosette leaves are dark green, reniform, and up to 10 cm wide. Rosette leaves remain green throughout the winter. Stem leaves are deltoid, serrate, alternate, and up to 8 cm wide. Petioles are pubescent and leaves give off strong garlic odor when crushed (Rowe and Swearingen 1997 and Nuzzo 2000).

Stems: Stems can reach heights over 1 m and one plant can produce one to many (Rowe and Swearingen 1997).

Roots: Roots consist of a slender, white taproot with a very distinctive “s” curve just below the crown (Nuzzo 2000).

Biology/Ecology:

Life Cycle: Garlic mustard seeds germinate early in the spring and spend their first year as a rosette. The following spring, flowering stems quickly develop, flower, produce seeds, and plants are dead by June (Rowe and Swearingen 1997 and Nuzzo 2000).

Mode of Reproduction: Reproduction is by seeds only.

Seed Biology: Thousands of seeds can be reproduced by each plant. Seeds require a cold period to germinate and most will germinate after one winter, although they can remain viable in the soil for up to 4 years (Nuzzo 2000).

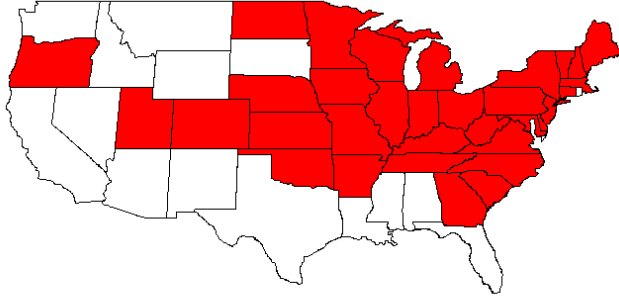
Dispersal: Most seeds fall near the parent plant but can be dispersed by wildlife and human activities (Rowe and Swearingen 1997).

Hybridization: None known.

Habitat and Distribution:

General Requirements: Garlic mustard thrives in moist, shaded areas, including forests, floodplains, roadsides, and other disturbed areas (Rowe and Swearingen 1997).

Distribution: Distribution data taken from BONAP.



Similar Species:

Exotics: No information available.

Natives: Rosettes can resemble other rosette species like violets (*Viola*) and avens (*Geum*). The distinction can be made in spring and summer by crushing a leaf and observing the odor. In fall and winter, these plants can be distinguished by observing the roots and looking for the “s” (Nuzzo 2000). At the adult stage, toothworts (*Dentaria*), sweet cicely (*Osmorhiza claytonii*), and early saxifrage (*Saxifraga virginica*) all live in the same habitat as garlic mustard and have similar white flowers (Rowe and Swearingen 1999).

Impacts:

Agricultural: None known.

Ecological: Garlic mustard threatens forest understory vegetation and wildlife by outcompeting native vegetation. Many animals will not graze garlic mustard but will eat nearby native species, creating more disturbance for garlic mustard to spread. Further, insects such as butterflies are forced to use the garlic mustard for egg laying in the absence of native vegetation, and many larvae die from eating the plant (Rowe and Swearingen 1997).

Human: None known.

Control:

Biocontrol: Currently being tested.

Mechanical: Hand pulling is not recommended as it can create further disturbance and bring up seeds from the seed bank. Cutting can be successful if performed at the right time. Cutting down the flowering plants at ground level is very effective at killing the plant, but because the cut stalks can still produce viable seed, all stalks should be gathered and burned. Mowing can disturb nearby native species and scatter seed and is not recommended except in areas such as roadsides. Disking is not recommended as it creates a large disturbance and will bring buried seeds to the surface (Nuzzo 2000).

Fire: Burning is inconsistent at best, and will not eliminate garlic mustard from an area (Nuzzo 2000).

Herbicides: Glyphosate is the most effective herbicide for garlic mustard control, but care must be taken not to contact desirable plants with it as it will kill almost any plant it touches (Rowe and Swearingen 1997).

Cultural/Preventive: Monitoring to locate small infestations and eradicate them is the best way to prevent the spread of garlic mustard.

Grazing: No information available.

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Musk Thistle

Carduus nutans

Family: Asteraceae (USDA, NRCS 2001).

Common Names: musk thistle, nodding thistle, nodding plumeless thistle (USDA, NRCS 2001).

Synonyms: *C. armenus*, *C. coloratus*, *C. schischkinii*, *C. thoermeri* (CDFA 2001).

USDA Code: *C. nutans*- CANU4 (USDA, NRCS 2001).

Legal Status: Listed as a noxious weed and seed in CA, CO, ID, KS, MD, MN, MO, NE, ND, OK, OR, SD, UT, and WY; as a noxious weed in IL, IA, KY, NV, NM, NC, OH, PA, WA, and WV; and a noxious seed in DE, HI, TN, and VA (USDA 2001 and USDA, NRCS 2001).

Identification:

Growth Form:

Biennial or occasionally a winter annual forb (CNAP 2000).

Flower: Flowers are rose to purple and occasionally white, usually occurring from May to September.

Heads are hemispherical, 2-7 cm in diameter, terminal, solitary, and nodding.

Disks are 20-25 mm long with 12-14 mm long tubes. Phyllaries are lanceolate to ovate, overlapping, spine tipped, and 3-8 mm wide. Receptacles are flat, covered in whitish bristles, and scattered among the flowers in the head. Flowers are subtended by spine tipped bracts (CNAP 2000 and CDFA 2001).

Seeds/Fruit: Fruit is an achene 4-5 mm long, curved, and gold to brown with longitudinal dotted stripes. Numerous pappus bristles form a ring at the base of the fruit. Bristles are 13-25 mm long and whitish (CNAP 2000 and CDFA 2001).



C. nutans plant (John M. Randall/TNC)



musk thistle flower (SWEMP)



juvenile flower showing phyllaries (SWEMP)



musk thistle seeds (CDFA)



seeds scattering (CDFA)

Leaves: Basal leaves are elliptic to lanceolate, 10-40 cm long, pinnately lobed, smooth to densely hairy, and have prickly margins. Stem leaves are alternate, smaller, smooth to woolly, dark green, deeply lobed, and have spiny margins. Leaves extend down the stem to form spiny wings (CNAP 2000 and CDFA 2001).

Stems: Stems are solitary or several, being highly branched near the top, and can be smooth or hairy. Stems can reach heights of up to 180 cm (CNAP 2000 and CDFA 2001).

Roots: Thick, fleshy taproots capable of reaching depths of 40 cm or more (CDFA 2001).



rosette (CDFA)

Biology/Ecology:

Life Cycle: Seeds germinate in the fall and form a rosette. In the spring, the rosette bolts and produces flower stalks. Flowering begins in late spring with seed maturation occurring 1-3 weeks later (CNAP 2000).

Mode of Reproduction: Reproduction is by seed only (CNAP 2000).

Seed Biology: Seed production varies widely between seed heads with the earlier heads producing as many as 1,500 seeds while the later heads may produce very few. Plants average about 10,000 seeds but may produce as many as 100,000. Most seeds germinate within a month of dispersal but can remain viable in the soil for as long as 10 years. Additionally, musk thistle seeds appear to have allelopathic properties which inhibits germination of other pasture plants (CNAP 2000 and CDFA 2001).

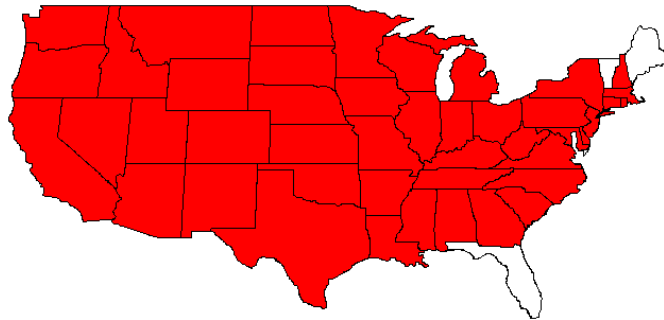
Dispersal: Although most seeds fall close to the parent plant, others are dispersed by wind, water, birds, small mammals, and human activities (CDFA 2001).

Hybridization: Musk thistle readily hybridizes with *C. acanthoides* where their distributions overlap (CDFA 2001).

Habitat and Distribution:

General Requirements: Other than requiring a vernalization period to induce flowering, musk thistle is adapted to a wide range of environmental conditions. It is most often found in well drained soils and typically inhabits disturbed open sites such as pastures, grasslands, roadsides, and waste areas (CNAP 2000 and CDFA 2001).

Distribution: Distribution data obtained from BONAP 2000.



Similar Species:

Exotics: *C. acanthoides* is similar looking to musk thistle but can be distinguished by the rosette leaves. Those of *C. acanthoides* are deeply serrate (sawtoothed) almost to the midrib (CNAP 2000). *Cirsium arvense* has unisexual flower heads and creeping roots, as well as smooth stems and plumose phyllaries.

Cirsium vulgare has plumose phyllaries and upper leaf surfaces covered with stiff bristles that are rough to the touch. *Onopordum acanthium* has honeycomb-like receptacles with deep pits that are not covered with bristles (CDFA 2001).

Natives: Several native species of *Carduus* resemble musk thistle but do not have stem leaves clasping all the way from node to node like musk thistle does (CNAP 2000).

Impacts:

Agricultural: Musk thistle is prevalent in pastures and is unpalatable to livestock (CNAP 2000).

Ecological: Musk thistle is highly competitive and forms dense stands which crowd out native vegetation. It also has allelopathic abilities at several stages of its life and can hinder nitrogen fixation, which creates suitable conditions for it to thrive (CNAP 2000).

Human: Spines can be painful to touch.

Control:

Biocontrol: Three insects have been released for the control of musk thistle: *Cheilisia corydon*, the thistle crown fly; *Rhinocyllus conicus*, the thistle head weevil; and *Trichosiromia horridus*, the thistle crown weevil. These agents will also attack other thistles as well, including Canada thistle, bull thistle, and Scotch thistle (CDFA 2001).

Mechanical: Hand pulling and mowing can be used to control musk thistle. The best time to treat is a couple of days after flowering is initiated but before seed set. This will need to be repeated due to different flowering times and rebolting from rootstock. Tillage can also be used but is not always practical (CNAP 2000 and CDFA 2001).

Fire: Prescribed burning will remove large stands of thistles but may not control rosettes (CDFA 2001).

Herbicides: Clopyralid, dicamba, MCPA, picloram, and 2,4-D are all effective against musk thistle in the rosette stage. The best time to apply these is in the fall when all the living thistles are either seedlings or rosettes. After bolting has occurred, chlorsulfuron and metsulfuron will prevent viable seed production (Beck 1999).

Cultural/Preventive: Controlling overgrazing in pastures and minimizing disturbances will help prevent musk thistle infestations. Maintaining native communities with plantings will also minimize disturbance and the potential for invasion by musk thistle.

Grazing: Overgrazing is one of the main reasons why thistles appear in pastures. Controlled grazing will prevent thistle infestation. Cattle and sheep will eat musk thistle plant tissues, but goats will eat only the flowers, and actually seem to prefer them to pasture grasses. Seeds are almost completely digested so there is little threat of spreading the seeds in feces (CDFA 2001).

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Knapweed Complex

Centaurea biebersteinii, *C. cyanus*, *C. debeauxii*, *C. diffusa*, *C. jacea*,
C. macrocephala, *C. nigra*, *C. nigrescens*, *C. trichocephala*, *C. triumphetti*

Family: Euphorbiaceae (CNAP 2000)

Common Names:

C. biebersteinii - spotted knapweed
C. cyanus - Bachelor's buttons, garden cornflower
C. debeauxii - meadow knapweed
C. diffusa - diffuse knapweed, white knapweed
C. jacea - brown knapweed
C. macrocephala - bighead knapweed
C. nigra - black knapweed, lesser knapweed
C. nigrescens - Tyrol knapweed, vochin knapweed, short-fringed knapweed
C. trichocephala - feather-head knapweed
C. triumphetti - squarrose knapweed (USDA, NRCS 2001).

Synonyms:

C. biebersteinii - *Centaurea maculosa*, *Acosta maculosa*
C. cyanus - *Leucantha cyanus*
C. debeauxii - *Centaurea pratensis*, reported to be a fertile hybrid of *C. nigra* & *C. jacea* (WSNWCB 2001)
C. diffusa - *Acosta diffusa*
C. jacea - None known
C. macrocephala - None known
C. nigra - None known
C. nigrescens - *Centaurea dubia*, *Centaurea vochinensis*
C. trichocephala - None known
C. triumphetti - *Centaurea squarrosa*, *Centaurea virgata* (USDA, NRCS 2001).

USDA Code:

C. biebersteinii - CEBI2
C. cyanus - CECY2
C. debeauxii - CEDE5
C. diffusa - CEDI3
C. jacea - CEJA
C. macrocephala - CEMA9
C. nigra - CENI2
C. nigrescens - CENI3
C. trichocephala - CETR12
C. triumphetti - CETR8 (USDA, NRCS 2001).

Legal Status:

C. biebersteinii - Listed as a noxious weed and seed in WY and as a noxious weed in AZ, CA, CO, ID, MN, MT, NE, NV, NM, ND, OR, SD, UT, and WA.
C. cyanus - Listed as a noxious seed in NC.
C. debeauxii - Listed as a noxious seed in WA.
C. diffusa - Listed as a noxious weed and seed in CO, ID, MT, NE, OR, UT, WA, and WY, as a noxious weed in AZ, CA, NV, NM, ND, and SD, and as a noxious seed in TX.
C. jacea - Listed as a noxious weed and seed in WA.
C. macrocephala - Listed as a noxious weed and seed in WA and as a noxious weed in OR.
C. nigra - Listed as a noxious weed and seed in CO and WA.
C. nigrescens - Listed as a noxious weed and seed in WA and as a noxious weed in OR.
C. trichocephala - Listed as a noxious weed in OR.
C. triumphetti - Listed as a noxious weed and seed in CO, OR, and UT and as a noxious weed in AZ and CA (USDA, NRCS 2001).



C. biebersteinii plant



C. macrocephala plant

Identification:

Growth Form: Biennial or perennial forb (CNAP 2000).

Flower: Flower heads consist of several disc flowers. Involucre consists of overlapping rows of comb-like or spine tipped phyllaries (CDFA 2001).



Centaurea with spiny phyllaries (SWEMP)



Spotted knapweed flower showing comb-like phyllaries (WSNWCB)

C. biebersteinii - Flowers are whitish to pink or purple, usually occurring from June to October. Phyllaries are 10-13 mm long, green or pink with parallel veins and dark tips, and comb-like (CDFA 2001).

C. cyanus - No information available.

C. debeauxii - Flowers are rose to purple and occasionally white, usually occurring from July to September. Phyllaries are light to dark brown, roundish, and comb-like (WSNWCB 2001).

C. diffusa - Flowers are white, pink, or lavender, occurring from June to September.

Phyllaries are pale green to yellowish and sometimes spotted, 10-13 mm long, comb-like and spine tipped with straw-colored spines up to 3 mm long (CNAP 2000 and CDFA 2001).

C. jacea - Flowers are rose to purple and occasionally white, usually occurring from July to October. Phyllaries consist of hairy, overlapping bracts (WSNWCB 2001).

C. macrocephala - Flowers are yellow and occur from July to August. Phyllaries are papery bracts with the lower bracts being slightly spiny (WSNWCB 2001).

C. nigra - Flowers are purplish and occur from July to October. Phyllaries are roundish comb-like bracts with dark margins (CNAP 2000 and WSNWCB 2001).

C. nigrescens - No information available.

C. trichocephala - No information available.

C. triumfetti - Flowers are lavender to pink or rose, usually occurring from June to August. Phyllaries are comb-like and spine tipped, 7-8 mm long, and green to straw colored with an occasional purple tinge (CNAP 2000 and CDFA 2001).

Seeds/Fruit: Fruits are oblong achenes 2.5-3.5 mm long with a flattened and notched base. Some species contain a pappus of whitish bristles or scales (CDFA 2001).



C. macrocephala flower (WSNWCB)



spotted knapweed seeds (CDFA)

C. biebersteinii - Seeds are dark and oval with lines and a ring of thin bristles (WSNWCB 2001).

C. cyanus - No information available.

C. debeauxii - Seeds are whitish to light brown that may have a barely visible plume of bristles (WSNWCB 2001).

C. diffusa - Seeds are dark brown with pappus bristles (CDFA 2001).

C. jacea - No information available.

C. macrocephala - Seeds are brown with ridges and a ring of light bristles (WSNWCB 2001).

C. nigra - Seeds are white with stripes and a ring of pale hairs (WSNWCB 2001).

C. nigrescens - No information available.

C. trichocephala - No information available.

C. triumfetti - Seeds are pale brown with or without scales (CDFA 2001).

Leaves: Leaves are alternate and covered with gray hairs. Rosette leaves are petiolate and deeply lobed, lower stem leaves are pinnately lobed, and upper stem leaves are generally linear and not winged. Stem leaves are sessile (CDFA 2001).

C. biebersteinii - Rosette leaves are deeply lobed and 15 cm long. Stem leaves are all pinnately divided. All the leaves are dotted with resin ducts (CNAP 2000 and CDFA 2001).

C. cyanus - No information available.

C. debeauxii - Lower leaves are up to 15 cm long and shallowly lobed while the upper leaves are not lobed. Leaves are all lanceolate (WSNWCB 2001).

C. diffusa - Basal leaves are pinnately divided and 15 cm long. Upper leaves are entire and linear (CDFA 2001).

C. jacea - Leaves are undivided and oblong to lanceolate in shape (WSNWCB 2001).

C. macrocephala - Leaves are serrate and lanceolate. Rosette leaves are up to 38 cm long (WSNWCB 2001).

C. nigra - Lower leaves are lobed, upper leaves are entire (CNAP 2000).

C. nigrescens - No information available.

C. trichocephala - No information available.

C. triumfetti - Lower leaves are deeply dissected and upper leaves are entire and linear (CNAP 2000 and CDFA 2001).

Stems:

C. biebersteinii - Stems to 1m tall, are one to several, and branched towards the top (CNAP 2000).

C. cyanus - No information available.

C. debeauxii - Can be highly branched and up to 1m tall (Callihan and Miller 1999).

C. diffusa - Stems are highly branched and up to 1 m tall (CNAP 2000).

C. jacea - Grows up to 1.2 m tall (WSNWCB 2001).

C. macrocephala - Stems are unbranched and can grow to 1.5 m (WSNWCB 2001).

C. nigra - Stems are sparsely branched above the middle and can grow to almost 1 m tall (WSNWCB 2001).

C. nigrescens - No information available.

C. trichocephala - No information available.

C. triumfetti - Generally has one highly branched stem that grows up to 1 m tall (Callihan and Miller 1999).

Roots: Knapweeds have a taproot and woody crown, but *C. nigra* also possesses lateral roots (CNAP 2000).

Biology/Ecology:

Life Cycle: Plants begin as rosettes and may spend 1 to several years in this form. Later the plant bolts, sending up a flowering stem that produces seeds (CNAP 2000).

Mode of Reproduction: Most species reproduce solely by seeds (CNAP 2000).

Seed Biology: Seed production varies between species and environmental conditions, but spotted knapweed infestations can produce up to 140,000 seeds/m². Germination can usually occur during spring and fall moist periods but *C. diffusa* and *C. biebersteinii* have three distinct germination patterns: non-dormant seeds not photosensitive, dormant seeds that are photosensitive, and dormant seeds that are not photosensitive (CNAP 2000 and CDFA 2001).

Dispersal: Seeds are usually dropped near the parent plant but can be dispersed by animals, water, and human activity (especially hay and vehicle undercarriages). Additionally, diffuse knapweed stalks can act as a tumbleweed, spreading seeds by wind (CNAP 2000).

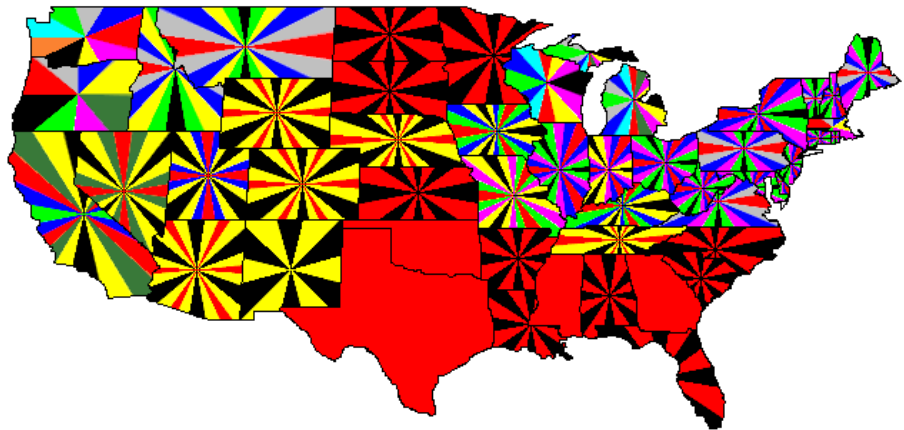
Hybridization: *C. debeauxii* is thought to be a fertile cross between *C. jacea* and *C. nigra* (Callihan and Miller 1999).

Habitat and Distribution:

General Requirements: Generally, knapweeds prefer dry, sunny, disturbed sites such as grasslands, rangelands, fields and open forests. However, *C. debeauxii* and *C. nigra* prefer more mesic areas, such as irrigation ditches, riverbanks, croplands, and wet meadows (CNAP 2000 and WSNWCB 2001).

Distribution: Distribution data obtained from BONAP 2000.

C. biebersteinii
C. cyanus
C. debeauxii
C. diffusa
C. jacea
C. macrocephala
C. nigra
C. nigrescens
C. trichocephala
C. triumphetti



Similar Species:

Exotics: Russian knapweed (*Acroptilon repens*) can sometimes be confused with *Centaurea* species (CNAP 2000).

Natives: Native species of the sunflower family (*Asteraceae*), such as *Centaurea americana* (American starthistle) can sometimes be confused with knapweeds in their rosette stage (CNAP 2000).

Impacts:

Agricultural: Knapweeds are particularly destructive in pastures and rangelands by out-competing forage crops and lowering the forage value of these lands (CNAP 2000).

Ecological: Knapweeds are highly competitive and can disrupt native plant communities and form dense monocultures. Allelopathy is also common among these species and can prevent the establishment of desirable plants. Additionally, their low forage value takes away wildlife habitat (CNAP 2000).

Human: Spotted knapweed can cause severe skin irritation if the sap comes into contact with the skin (CNAP 2000).

Control:

Biocontrol: Many insects have been released for control of knapweeds, where they are mainly targeted at the flowerheads, seeds, and roots, and many of these species have been shown to control several knapweed species: *Urophora quadrifasciata*, the seeds head gall fly, is effective on *C. biebersteinii*, *C. debeauxii*, *C. diffusa*, *C. jacea*, and *C. triumphetti*. *Urophora affinis*, the banded gall fly, is effective on *C. biebersteinii*, *C. diffusa*, and *C. triumphetti*. *Cyphocleonus achates*, a root weevil, is also effective against *C. biebersteinii*, *C. diffusa*, and *C. triumphetti*. Other biocontrol agents include: *Bangasternus fausti*, a seed head weevil; *Sphenoptera jugoslavica*, a root borer; *Chaetorellia acrolophi*, the peacock fly; *Larinus minutus*, a flower weevil; *Terellia virens*, the green clearwing fly; *Larinus obtusus*, the blunt knapweed flower beetle; *Metzneria paucipunctella*, a seed head moth; *Agapeta zoegana*, the sulfur knapweed moth; and *Pterolanche inspersa*, the grey winged root moth (Roché 1999, Roché and Roché 1999, Sheley et al 1999, CDFA 2001, and WSNWCB 2001).

Mechanical: Hand pulling can be used for small infestations but must be repeated several times a year and repeated several years. Mowing generally is not effective if there is already an established seed bank but will lessen seed production in newly infested areas. Tilling low enough in the soil to prevent resprouting is the best mechanical control method. Tillage to a depth of at least 20 cm is required to break off enough of the root and repeated tillage is usually required. Tilling or mowing in addition to herbicide or other control method is usually more effective (Roché 1999, Roché and Roché 1999, Sheley et al. 1999, and CNAP 2000).

Fire: Fire alone is not effective for knapweed control, and the disturbance can actually increase the infestation. Fire in addition to herbicide treatment and/or native grass planting can have a much more desirable effect (Roché and Roché 1999).

Herbicides: Several herbicides are effective at controlling knapweeds and may offer the best chance of control. Picloram, dicamba, clopyralid, glyphosate, and 2,4-D used in different amounts and combinations can control any of the knapweed species (Roché 1999, Roché and Roché 1999, Sheley et al 1999, and CNAP 2000).

Cultural/Preventive: Proper management of grazing areas and disturbed sites, preventing transportation of seed, and establishment and management of native plantings are effective at preventing the spread of knapweed.

Grazing: Grazing can be effective when it is timed to the dormant period of pasture grasses and before the knapweeds develop spines (Roché and Roché 1999).

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Canada and Bull Thistles

Cirsium arvense and *C. vulgare*

Family: Asteraceae (USDA, NRCS 2001).

Common Names:

C. ravense - Canada thistle, creeping thistle, California thistle, field thistle.

C. vulgare - bull thistle, common thistle, spear thistle (USDA, NRCS 2001).

Synonyms:

C. arvense - *C. incanum*, *C. setosum*, *Carduus arvensis*, *Serratula arvensis*

C. vulgare - *C. lanceolatum*, *Carduus lanceolatus*, *Carduus vulgaris* (USDA, NRCS 2001).

USDA Code:

C. arvense - CIAR4

C. vulgare - CIVU (USDA, NRCS 2001).

Legal Status:

C. arvense - Listed as a noxious weed and seed in AZ, CA, CO, DE, HI, ID, IL, IN, IA, KS, KY, MD, MN, MO, MT, NE, NV, NM, NC, ND, OH, OK, OR, PA, SD, UT, WA, WI, and WY and as a noxious seed in AL, AK, CT, FL, GA, LA, ME, MI, MS, NH, NJ, NY, RI, TN, TX, VT, VA, and WV.

C. vulgare - Listed as a noxious weed and seed in CO and MN, as a noxious weed in MI, and as a noxious seed in IA, MD, NM, OR, and PA (USDA 2001 and USDA, NRCS 2001).

Identification:

Growth Form:

C. arvense - perennial forb.

C. vulgare - biennial forb (CNAP 2000).

Flower: Flowers have overlapping rows of spine-tipped phyllaries.

C. arvense - Flowers are white to purple, usually occurring from June to October. Heads are 1 cm in diameter, clustered, unisexual, and cylindrical to bell shaped. Crushed heads also give off a strong vanilla scent. Involucre is usually purplish, with outer bracts ovate with spreading tips. Spines are 1 mm long. Corollas in male (staminate) flowers are 10-14 mm long while those of the female (carpellate) flowers are 14-20 mm long.

C. vulgare - Flowers are pinkish to dark purple, usually occurring from June to October. Heads are up to 5 cm in diameter, clustered, perfect, and hemispheric to bell shaped. Heads are also covered with cobwebby hairs, and have at least one bract-like leaf just below. Phyllaries are lanceolate to linear, with spines 1-5 mm long and yellowish. Corollas are 25-35 mm long (CNAP 2000 and CDFA 2001).

Seeds/Fruit: Fruits are achenes that are ovate to elliptic, smooth, and glossy. There is a basal attachment scar and a small beak surrounded by a collar. Pappus bristles are present, forming a ring at the base.

C. arvense - Seeds are straw or light brown, straight or slightly curved, with tan bristles. Achenes are 2-4 mm long with bristles 12-20 mm long.

C. vulgare - Seeds are gray or tan and may have darker stripes.

Achenes are 3-5 mm long with white bristles 15-30 mm long (CNAP 2000 and CDFA 2001).



bull thistle plant (CDFA)



C. arvense flower and seed head (WSNWCB)



C. vulgare flower head (CDFA)



C. vulgare seeds (CDFA)



C. arvense seeds (CDFA)



C. vulgare seed head (John M. Randall/TNC)



C. vulgare rosette (Barry Meyers-Rice/TNC)

Leaves: Leaves are alternate, spiny, and toothed or lobed.

C. arvense - Few or no rosette leaves that are stalkless and clasping. All leaves oblong to lanceolate and 5-20 cm long. Margins entire to shallowly lobed and toothed with prickles 3-6 mm long. Upper leaf surfaces are smooth and green. Lower surfaces smooth to sparsely hairy. Leaves can extend down the stem to give inconspicuous prickly wings.

C. vulgare - Rosette leaves are elliptic to lanceolate and 10-40 cm long with lobed and toothed margins. Stem leaves are smaller and more deeply lobed and spinier than rosettes. Upper leaf surfaces green and covered with prickles 1 mm long and sometimes cobwebby. Lower leaf surfaces are cobwebby. Leaf bases extend almost from node to node producing visible prickly wings (CNAP 2000 and CDFA 2001).

Stems:

C. arvense - Stems are to 1 m, slender, smooth, and numerous from creeping roots.

C. vulgare - Stems are to 2 m, single, loosely covered with cobwebby hairs, with strongly decurrent leaves (CNAP 2000 and CDFA 2001).

Roots:

C. arvense - Highly branched roots extend both vertically and horizontally, with the latter producing shoots several meters laterally. Most roots are located in the top 45 cm of soil, but vertical roots can reach to depths up to 3 m.

C. vulgare - Root is a thick taproot up to 70 cm deep (CNAP 2000 and CDFA 2001).

Biology/Ecology:

Life Cycle:

C. arvense - Seeds germinate in the spring and form a rosette. Leaves die back in the fall and roots continue developing new roots and shoot buds in the winter. Shoots emerge in the spring and long days (>14 hours) trigger bolting and flowering. Flowering occurs from late spring to fall with seed maturation occurring in the summer and fall.

C. vulgare - Seeds germinate in the fall or spring and form rosettes for their first year. Rosettes require vernalization and adequate nitrogen to flower. Flowering occurs from summer to early fall with the plant dying after seed is mature (CNAP 2000 and CDFA 2001).

Mode of Reproduction:

C. arvense - Canada thistle reproduces primarily by creeping horizontal roots. A 1-cm long root fragment is capable of producing a new plant. Canada thistle can also reproduce by seeds on the female plant.

C. vulgare - Reproduces by seeds only (CNAP 2000 and CDFA 2001).

Seed Biology:

C. arvense - A female plant can produce up to 5,000 seeds but the average is around 1,500. Viable seed is produced only if a male plant is within about 400 m of the female, and occasionally a male plant will contain functional ovaries and produces seed as well. The majority of seeds will germinate in the first 3 years but can survive 10 years.

C. vulgare - Plants can produce up to 10,000 seeds but may take several years to flower depending on environmental conditions. Seeds generally germinate within their first year or die, but can remain dormant for up to 3 years (CNAP 2000 and CDFA 2001).

Dispersal: Seeds usually fall fairly close to the parent plant but can be carried long distances by the wind. Also birds and small mammals, as well as human activities such as contaminated hay, are responsible for their spread (CNAP 2000 and CDFA 2001).

Hybridization: No information available.

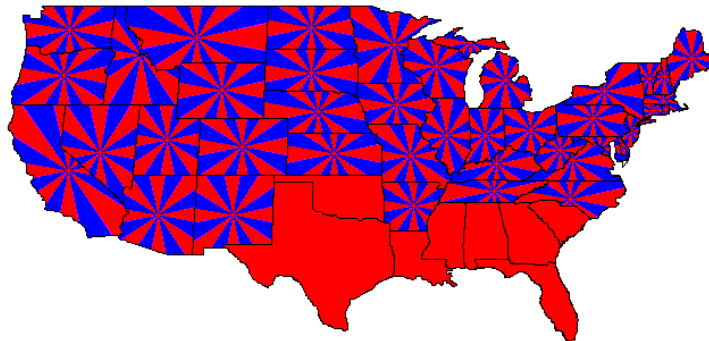
Habitat and Distribution:

General Requirements: Both species are shade intolerant and do not invade healthy forests. Generally both can be found in pastures, grasslands, roadsides, and open forests. Because Canada thistle stops growing completely at higher temperatures, it is generally found in a more northerly range than bull thistle.

Distribution: Distribution data taken from BONAP.

C. arvense-

C. vulgare-



Similar Species: Because of the numerous rare and endangered native *Cirsium* species, it is imperative to correctly identify thistles before implementing control efforts.

Exotics:

C. arvense - *Onopordum acanthium*, Scotch thistle, has spiny flower bracts and winged stems. *Carduus acanthoides*, plumeless thistle, has sharp, spiny floral bracts. *Carduus nutans*, musk thistle, has broad floral bracts with spiny tips. *Acroptilon repens*, Russian knapweed, has broad, pointy, papery flower bracts.

C. vulgare - The easiest way to distinguish bull thistle from other similar species is to look for a spiny upper leaf surface and smooth lower surface, as well as very strongly decurrent leaves from node to node.

Natives:

C. arvense - There are numerous similar thistle species that are native to the United States, many of them rare or even endangered. Most native thistle species have hairy upper and lower leaf surfaces and their foliage is generally lighter green/blue. None of them have unisexual flower heads.

C. vulgare - There are numerous similar thistle species that are native to the United States, many of them rare or even endangered. Most native thistle species have hairy upper and lower leaf surfaces and their foliage is generally lighter green/blue. Additionally, most do not leaves clasping from one node to the next (CNAP 2000 and CDFA 2001).

Impacts:

Agricultural: Pastures overrun with thistles have less forage value and lower hay prices.

Ecological: Monocultural stands of thistles can exclude native vegetation.

Human: Spines can be painful and bull thistle is linked to hay fever (CNAP 2000).

Control:

Biocontrol: For bull thistle, the seedhead gall fly (*Urophora stylata*) was released for control. Nothing has been released specifically for Canada thistle, although several insects released for other thistles attack it as well as bull thistle (Beck 1999 and CNAP 2000).

Mechanical: Repeated mowing during the growing season will halt seed production but must be repeated for several years to exhaust the seed bank. It has also been found that this procedure does not work as well on Canada thistle as it does on bull thistle because of Canada thistle's extensive root system (CNAP 2000).

Fire: Prescribed burning can slow the spread of thistles by reducing the number of mature plants and stimulating growth of grasses (CNAP 2000).

Herbicides:

C. arvense - Single herbicide applications will not kill the roots of Canada thistle even though the shoot is dead. 2,4-D and MCPA can be used before the budding stage. Dicamba and clopyralid can be applied at anytime during the active growing stage and on regrowth or rosettes in the fall. Glyphosate can be used late in the growing season beyond the bud stage (Morishita 1999).

C. vulgare - Clopyralid, dicamba, MCPA, picloram, and 2,4-D are all effective against bull thistle in the rosette stage. The best time to apply these is in the fall when all the living thistles are either seedlings or rosettes. After bolting has occurred, chlorsulfuron and metsulfuron will prevent viable seed production (Beck 1999).

Cultural/Preventive: Minimizing disturbances and reducing overgrazing can significantly reduce infestations. Purchasing weed free seed and managing native communities will also reduce the risk (CNAP 2000).

Grazing: Although thistles are not very palatable to livestock, sheep and goats will eat them. Goats actually seem to prefer the flowers of thistles to pasture grasses (CNAP 2000).

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Chinese Yam
Dioscorea oppositifolia

Family: Dioscoreaceae (EEBC 2000).

Common Names: Cinnamon Vine (Bradley).

Synonyms: *Dioscorea batatas* (USDA, NRCS 2001).

USDA Code: DIOP (USDA, NRCS 2001).

Legal Status: No noxious weed or seed ranking at the present time.

Identification:

Growth form: Twining perennial vine capable of reaching approximately 4 m high (USDA, NRCS 2001).

Flower: Dioecious. Petals and sepals each 3. Staminate (male) and pistillate (female) flowers in spikes or panicles. Spikes in axils of opposite leaves or terminal and paniculate. Ovary 3-lobed, 3 stigmas, each stigma is bilobed. The greenish, yellow flowers of the Chinese Yam bloom from June to August (Radford et al. 1968, Bradley, Russell 1997).

Seeds/Fruit: The seed is surrounded by a 3-angled capsule or wing. The seeds are about 1.5-3 cm long and 1.5-2 cm in diameter (Radford et al. 1968, Bradley, EEBC 2000).

Leaves: The upper leaves of the Chinese Yam are alternate and the lower leaves are opposite. The leaves are heart-shaped with a long tapering point. The top of the leaf is smooth; the underside can be smooth or have small hairs. New leaves often have a slight bronze color. Leaves have parallel veins (Radford et al. 1968). Late in the season, leaves usually have small (0.7-3 cm) potato-like tubers in the axils.

Stems: The slightly woody vines of the Chinese Yam wind upward in a clockwise direction (i.e., from left to right).

Roots: The tuberous roots of the Chinese Yam can grow up to 1 m long (EEBC 2000).



heart-shaped leaves (Bradley)



bronze tint of new leaves (Bradley)



twining stem (Bradley)

Biology/Ecology:

Life Cycle: Perennial.

Mode of reproduction: Chinese Yam can reproduce from the tubercles that form on the stem of the plant (EEBC 2000).

Seed Biology: No information currently available.

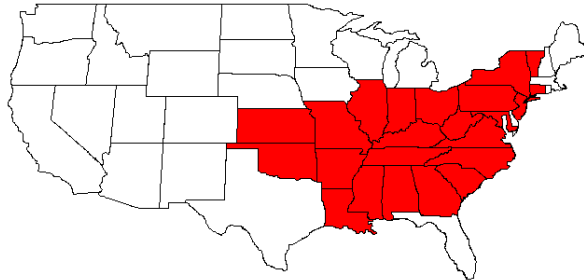
Dispersal: Tubercles can be dispersed by squirrels and other rodents.

Hybridization: No information currently available.

Habitat and Distribution:

General requirements: Found along fence rows, streams, old home sites in wooded areas, and other waste places (RAI 1999).

Distribution: Distribution data obtained from BONAP 2000.



Similar Species:

Exotics: None known.

Natives: The appearance of Chinese Yam is very similar to that of wild yam (*Dioscorea villosa*). The easiest way to tell the difference between the plants is by comparing the direction that the vines turn when winding upward. The vines of Chinese Yam turn left to right, while the vines of wild yam turn right to left. In addition, wild yam may have whorled lower leaves and never bears tubers (Radford et al. 1968). Morning glories can also be mistaken for Chinese Yam, but the Chinese Yam has more distinct leaf veins and young leaves have a bronze tint (Bradley). Chinese Yam should be accurately identified before attempting any control measures.

Impacts:

Agricultural: Currently, Chinese Yam does not pose a problem to agricultural crops. However, it has the potential to negatively impact cultivated areas such as landscaping, nurseries, horticultural crops, plantations, tree farms, and reforestation sites.

Ecological: Chinese Yam is not very widespread in the United States, but its tendency to aggressively invade an area where it is present makes it a potentially serious problem (RAI 1999).

Human: No known human impacts.

Control:

Biocontrol: No biocontrol agents currently available.

Mechanical: Chinese Yam can be controlled with repeated pulling (RAI 1997).

Fire: No known applications.

Herbicides: Glyphosate is most effective if applied to the foliage or cut stems in the late summer/early fall when the plant is transporting nutrients to the roots. Always follow herbicide label directions and precautions.

Cultural/Preventive: Monitoring for Chinese Yam in or around sensitive natural areas is recommended.

Grazing: No known applications.

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Autumn and Russian Olive
Elaeagnus umbellata, *E. angustifolia*

Family: Elaeagnaceae (USDA, NRCS 2001).

Common Names:

E. umbellata - autumn olive, oleaster

E. angustifolia - Russian olive, oleaster (USDA, NRCS 2001).

Synonyms: None known.

USDA Code:

E. angustifolia - ELAN

E. umbellata - ELUM (USDA, NRCS 2001).

Legal Status:

E. angustifolia - Listed as a noxious weed in NM.

E. umbellata - Listed as a noxious weed in WV (USDA, NRCS 2001).

Identification:

Growth form: Deciduous perennial shrub or small tree (Muzika and Swearingen 1998).

Flower: Flowers are yellowish and occur from May to July. Flowers are perfect and contain four stamens and four sepals (Radford et al. 1968, Mohlenbrock 1986, Sather and Eckhardt 1987, and Muzika and Swearingen 1998).



autumn olive (John M. Randall/TNC)



Russian olive (John M. Randall/TNC)

Seeds/Fruit: Fruit is a drupe that is silvery colored when immature. In Russian olive, the fruits are yellow, and in autumn olive the fruits are red or pink and scaly (Mohlenbrock 1986, Sather and Eckhardt 1987, and Muzika and Swearingen 1998).



immature fruit (John M. Randall/TNC)



Russian olive fruit (Barry Meyers-Rice/TNC)

Leaves: Leaves are simple, alternate, entire, and covered on their lower surfaces with silvery scales. Autumn olive leaves are ovate to lanceolate, while Russian olive leaves are elliptic to lanceolate (Radford et al. 1968 and Mohlenbrock 1986).

Stems: Stems can reach up to 10 m in height. Branchlets have rusty brown to silvery scales. Russian olive has thorny branches (Mohlenbrock 1986 and Muzika and Swearingen 1998).

Roots: Roots are able to fix nitrogen (Sather and Eckhardt 1987, and Muzika and Swearingen 1998).

Biology/Ecology:

Life cycle: Both species break dormancy very early in the spring and begin flowering. Flowering usually occurs after a few years. Seed production is prolific and fruits are readily eaten by birds. Seeds require stratification to germinate (Sather and Eckhardt 1987, and Muzika and Swearingen 1998).

Mode of reproduction: Reproduction is mostly by seed, with some vegetative reproduction coming from the roots (Muzika and Swearingen 1998).

Seed Biology: Both species produce vast amounts of seed. Autumn olive can produce yearly crops of seeds that number in the hundreds of thousands. Germination requirements and seed bank information is not available (Sather and Eckhardt 1987).

Dispersal: Dispersal is mainly by birds, although small mammals may contribute.

Hybridization: No information available.

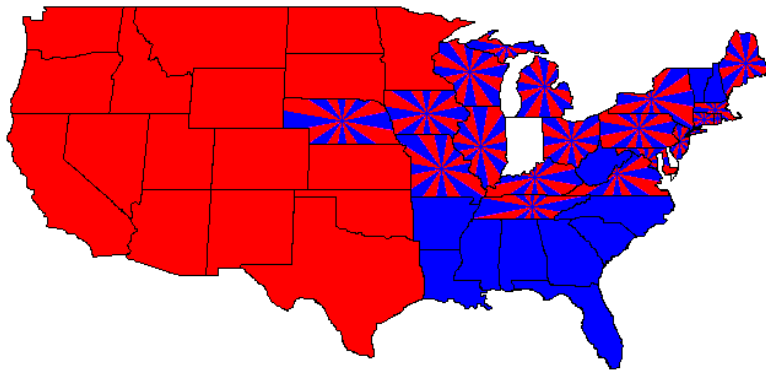
Habitat and Distribution:

General requirements: Although both species can tolerate a wide range of environmental conditions, Russian olive can tolerate shade and moisture better than autumn olive. They mainly occur on disturbed sites such as roadsides, pastures, fields, ditch banks, riparian zones, open woodlands, and grasslands (Sather and Eckhardt 1987, and Muzika and Swearingen 1998).

Distribution: Distribution data obtained from BONAP 2000.

E. umbellata

E. angustifolia



Similar species:

Exotics: Several other exotic *Elaeagnus* species are similar to Russian and autumn olive but are much less widespread.

Natives: American silverberry (*E. commutata*) is distinctively marked with brown and silvery scales on twigs and both sides of leaves.

Impacts:

Agricultural: None known.

Ecological: Because of their fast growth, aggressive nature, and prolific seed production that is widespread by birds, these species can crowd out desirable vegetation. Additionally, their ability to fix nitrogen allows them to invade areas most other species cannot. This ability also allows them to affect the nutrient cycling and may adversely effect native plants that require low fertility habitats to compete successfully (Sather and Eckhardt 1987, and Muzika and Swearingen 1998).

Human: None known.

Control:

Biocontrol: Currently, no biocontrol agents are known.

Mechanical: Cutting or mowing remove only the visible portion of the plant and new shoots will emerge. Herbicide application following mechanical treatment is the only effective control measure (Sather and Eckhardt 1987).

Herbicides: Glyphosate added to cut stems or stumps is the most effective control method. This works best in late summer or early fall. Triclopyr can be used for basal applications in the winter (Sather and Eckhardt 1987).

Cultural/Preventative: Eradicating small populations and decreasing disturbance will aid in the prevention of infestations.

Grazing: Grazing is currently not a suitable control method.

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Winged Burning Bush

Euonymus alatus

Family: Celastraceae (USDA, NRCS 2001).

Common Names: Winged euonymus, burning bush (USDA, NRCS 2001).

Synonyms: *Celastrus alatus*, also known as *Euonymus alata* (USDA, NRCS 2001).

USDA Code: EUAL8 (USDA, NRCS 2001).

Legal Status: Currently not listed.

Identification:

Growth Form: Winged burning bush is a slow-growing deciduous shrub (Morisawa 2000).

Flower: Flowers are yellowish green, inconspicuous, and usually occur from April to June (Morisawa 2000).

Seeds/Fruit: Fruits are smooth, purplish, up to 13 mm long, and are present in the fall (Morisawa 2000).

Leaves: Leaves are opposite, elliptic to obovate, up to 7.5 cm long and 3 cm wide, and have finely serrated margins. Leaves turn a brilliant red in the fall (Morisawa 2000 and VDCR 2001).

Stems: Stems can reach up to 6 m in height and have dull brown bark. Bark also has distinctive corky wings running along both sides of the stems (Morisawa 2000 and VDCR 2001).

Roots: No information available.



fall foliage (UCONN)



inconspicuous flowers and foliage (UCONN)



winged stems (UCONN)

Biology/Ecology:

Life Cycle: Plants are deciduous and break dormancy in the spring. Leaves and flowers appear soon after and fruits are visible in the fall.

Mode of Reproduction: Seed is the major source, although it may reproduce vegetatively as well.

Seed Biology: Seed production or seed bank information is not known. Seeds are viable after passing through the digestive tract of birds (Morisawa 2000).

Dispersal: Birds feed on the fruit and transport seeds, which pass through their digestive tracts and then readily

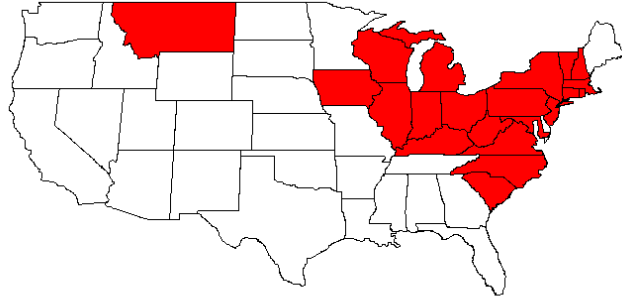
germinate. Its range is steadily increasing due to its popularity as an ornamental shrub, which expands its distribution that is then aided by subsequent animal transport (Morisawa 2000 and VDCR 2001).

Hybridization: No information available.

Habitat and Distribution:

General Requirements: Burning bush can tolerate a wide range of environmental conditions, from full sun to full shade, as well as varying soil types, pH ranges, and moisture. It is currently invading upland and lowland forests, pastures, and hill prairies (Morisawa 2000).

Distribution: Distribution data obtained from BONAP 2000.



Similar Species:

Exotics: Some other exotic *Euonymus* species are similar to burning bush but none have winged bark.

Natives: There are several native *Euonymus* shrubs that are similar to burning bush, but none have winged bark (Mohlenbrock 1986).

Impacts:

Agricultural: None known.

Ecological: In natural areas, winged burning bush threatens native species of herbs and shrubs through shading and crowding effects (VDCR 2001).

Human: None known.

Control:

Biocontrol: Currently none available.

Mechanical: Hand pulling seedlings can help keep infestations in check. Cutting established shrubs will prevent seeding.

Fire: No information available.

Herbicides: A cut stump treatment with glyphosate is effective at killing burning bush (Morisawa 2000).

Cultural/Preventative: Burning bush is extremely popular as an ornamental shrub and is readily available at most commercial nurseries. Refraining from purchasing this species will slow its spread.

Note of Caution: By law, herbicides may only be applied according to label directions and by licenses herbicide applicators or operators when working on public properties.

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Spurges

Euphorbia cyparissias, *E. esula*, *E. myrsinites*, *E. oblongata*, *E. serrata*, *E. terracina*

Family: Euphorbiaceae (CNAP 2000).

Common Names:

E. cyparissias - cypress spurge, graveyard spurge (CNAP 2000).

E. esula - leafy spurge, wolf's milk (CNAP 2000).

E. myrsinites - creeping spurge, donkeytail, myrtle spurge (CNAP 2000).

E. oblongata - eggleaf spurge, oblong spurge (WSNWCB 2001).

E. serrata - serrate spurge, toothed spurge, saw-toothed spurge (CDFA 2001).

E. terracina - Geraldton carnation weed (EWAN 2001).

Synonyms: *E. esula* = *E. pseudovirgata*, *E. virgata*, *E. discolor*, *E. gmelinii*, *Tithymalus esula*, and *Galarrhoes esula* (CDFA 2001 and USDA, NRCS 2001).

USDA Code:

E. cyparissias - EUCY2

E. esula - EUES

E. myrsinites - EUMY2

E. oblongata - EUOB4

E. serrata - EUSE12

E. terracina - EUTE10 (USDA, NRCS 2001)

Legal Status:

E. cyparissias- CO Noxious Weed & Seed

E. esula- AZ, CA, CO, ID, IA, KS, MN, MT, NE, NV, ND, OR, SD, UT, WA, WI, WY- Prohibited Noxious Weed & Seed; HI, NM- Prohibited Noxious Weed; IL, NY, OH- Prohibited Noxious Seed; MO- Restricted Noxious Seed

E. myrsinites- CO Prohibited Noxious Weed & Seed

E. oblongata- CA Class B Noxious Weed & Seed

E. serrata - CA Class A Noxious Weed & Seed

E. terracina- CA Class Q Noxious Weed & Seed (USDA 2001 and USDA, NRCS 2001)



E. esula (USDA/ARS)

Identification:

Growth Form:

E. cyparissias - shrub-like perennial forb reaching 30-45 cm in height (CNAP 2000).

E. esula - perennial forb reaching 1 m in height (CNAP 2000).

E. myrsinites - perennial forb reaching 10-15 cm in height with a spread of up to 45cm (CNAP, 2000).

E. oblongata - perennial forb reaching 1 m in height (CDFA 2001).

E. serrata - perennial forb reaching 1 m in height (CDFA 2001).

E. terracina- shrub-like perennial forb reaching 1 m in height (EWAN 2001).

Flower: Monoecious with flowers in an umbel at the stem tips. Perianth absent. *Euphorbia* flowers are very distinct, being arranged in cup-like clusters called a cyathium. The flower colors range from a light yellow to green (purplish in *E. serrata*) and sit above two to several yellowish leaf bracts (CNAP 2000 and CDFA 2001).

Seeds/Fruit: Seeds are oblong to round and smooth to slightly warty, with colors ranging from gray to brown to purple. Sizes range from 1 to several mm in diameter. Seeds are arranged in 3-chambered capsules 3-6 mm long with a yellowish spot where it was attached. Capsules can explode at maturity, throwing seeds up to 6 m (CNAP 2000, CDFA 2001, and WSNWCB 2001).



E. esula seed (CDFA)

Leaves: Leaves are sessile, glabrous, and mostly alternate, and contain a poisonous white, milky latex (CDFA 2001).

E. cyparissias - small, linear (OVMA 2001).

E. esula - linear to oblanceolate, 2-10 cm long and 6 mm wide (CNAP 2000).

E. myrsinites - fleshy, blue-green, evergreen (CNAP 2000).

E. oblongata - oblong to elliptic with broadly rounded tips, 3-8 cm long, minutely toothed margins (CDFA 2001).

E. serrata - linear to ovate-lanceolate, 2-5 cm long, finely toothed margins (CDFA 2001).

E. terracina - No information available.

Stems: Stems contain a poisonous white, milky latex. Stems are usually clustered and woody at the base, reddish to dark green in color, and can be glabrous or slightly hairy (CNAP 2000 and CDFA 2001).

Roots: Roots are numerously branched and highly spreading. Taproots are woody at the crown.

Horizontal roots and crowns are covered with red buds that can produce new stems or roots. Roots spread laterally up to 5 m but can reach as far down as 9 m (CDFA 2001).

Biology/Ecology:

Life Cycle: Perennials resprouting from roots or seeds. Emergence is usually very early in the spring with flowering occurring from early to late spring but can persist throughout the growing season under optimal conditions (CNAP 2000).

Mode of Reproduction: Reproduction can occur from seed production or vegetatively through extensive root systems (CNAP 2000).

Seed Biology: Production of seeds in leafy spurge is around 200 seeds per shoot, but with a clonal stand, can be over 100,000 (CNAP 2000). Seeds germinate between temperatures of 20-30°C after a stratification period, with light and scarification hindering germination, and can remain viable in the soil for up to 8 years (CDFA 2001).

Dispersal: Seeds are dispersed by the exploding capsule they are in, and by livestock, contaminated hay, people, and machinery. Seeds can also float on water and may be spread by runoff and floods (CNAP 2000).

Hybridization: Leafy spurge itself is a complex of several hybrids of unknown origin (OVMA 2001). Cypress spurge and leafy spurge have been known to hybridize but no other information is available (WSNWCB 2001).

Habitat and Distribution:

General Requirements:

E. cyparissias - dry to moist uncultivated soils, mainly pastures, meadows, roadsides, and forest edges (OVMA 2001).

E. esula - most aggressive in dry uncultivated areas, mainly pastures, rangelands, fields, roadsides, and waste areas, but can also be found in riparian zones (CDFA 2001).

E. myrsinites - dry to moist disturbed and waste areas with well drained soils (CNAP 2000).

E. oblongata - dry to damp pastures, woodlands, fields, roadsides, and waste areas (WSNWCB 2001).

E. serrata - dry to moist fields, pastures, roadsides, and waste areas (CDFA 2001).

E. terracina - well-drained soils high in calcium carbonate, disturbed areas (EWAN 2001).

Distribution: Distribution data obtained from BONAP 2000.

E. cyparissias

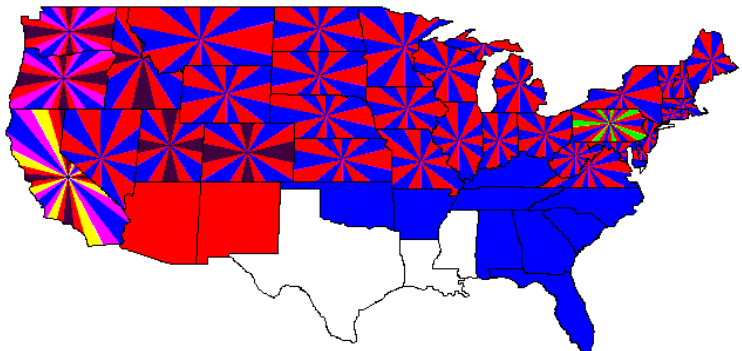
E. esula

E. myrsinites

E. oblongata

E. serrata

E. terracina



Similar Species:

Exotics: *E. helioscopia*, wartweed, *E. lathyris*, gopher weed, and *E. peplus*, petty spurge, are similar-looking exotics. These are annuals, however, and can be distinguished by their lack of woody root crowns and scaly buds. Gopher weed also has opposite leaves and petty spurge has petioles (CDFA 2001 and WSNWCB 2001).

Natives: There are many native spurges, both annual and perennial, so similarities will have to be determined on a site-by-site basis depending on species present.

Impacts:

Agricultural: Spurges are generally not tolerant of cultivation and are not a concern in crops. In pastures and rangelands, they are a serious threat due to their aggressive nature and their poisonous latex. Livestock can be poisoned, but generally avoid spurges. This avoidance allows spurges to invade other nearby areas that have been grazed, rendering these areas useless (CNAP 2000).

Ecological: Because of their extensive rhizomatic root systems and early emergence, spurges have a big advantage over vegetation in natural areas. Spurges are also allelopathic and hinder growth of nearby desirable plants, leading to large monocultural stands of spurges. This threatens native plants and displaces wildlife (CNAP 2000).

Human: The milky latex found in spurges can have severe effects on individuals, ranging from minor irritation to blisters and swelling, is toxic if ingested, and can cause blindness if rubbed in the eyes (CNAP 2000).

Control:

Biocontrol: For *E. esula*, a number of biocontrol agents, including insects and fungi, are being tested for potential use. Nine species of insects have been released for use in controlling leafy spurge: six flea beetle species: *Aphthona abdominalis*, *A. cyparissiae*, *A. czwalinae*, *A. flave*, *A. lacertosa*, and *A. nigriscutis*; a moth, *Hyles euphorbia*; a stem borer, *Oberea erythrocephala*; and a gall midge, *Spurgia esulae*. The beetle larvae feed on the roots while the adults feed on the stems, flowers, and leaves (CDFA 2001).

Mechanical: Mowing is not recommended as this only promotes more shoot growth, although it can be detrimental to seed production. Tillage will prevent spurges from persisting. In areas already affected by spurges, two tillage operations will help reduce their occurrence but equipment must be cleaned to prevent spread. Hand pulling is not recommended as this will have to be repeated numerous times over the course of several years. If this is used for small patches, gloves should be worn to prevent exposure to latex (CDFA 2001).

Fire: Fire alone will not eradicate spurges due to root reserves. Fire can stimulate native plant growth but needs to be used in conjunction with herbicides for control (CDFA 2001).

Herbicides: Herbicides alone will not kill spurges due to large underground reserves for new growth. Most often the amount of herbicides that are required will exceed the allowable dosage. Herbicides used with other practices such as fire, grazing, and mechanical controls will provide the best opportunity for eradication. Grazing followed by application of picloram and 2,4-D have had a desirable effect on controlling leafy spurge. Other herbicides used in controlling spurges are dicloram and glyphosate (CNAP 2000).

Cultural/Preventive: The use of native and non-native grasses has been shown to slow the spread of spurges. Some non-native grass species can actually outcompete and displace leafy spurge. The use of native grasses is the best preventative, however. A mixture of grasses that grow in different seasons and use up the available nutrients are the best way to keep spurges out of an area (CNAP 2000 and CDFA 2001).

Grazing: Sheep and goats are generally immune to the spurge toxins and can be used to control most species. These animals should be kept in a holding area after grazing on affected ground to prevent them from transferring seeds to more sites (CDFA 2001).

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Buckthorns

Frangula alnus, *Rhamnus cathartica*

Family: Rhamnaceae (USDA, NRCS 2001).

Common Names:

Frangula alnus - glossy buckthorn, columnar buckthorn, fen buckthorn, alder buckthorn.

Rhamnus cathartica - common buckthorn, European buckthorn (USDA, NRCS 2001).

Synonyms:

Frangula alnus - *Rhamnus frangula* (USDA, NRCS 2001).

Rhamnus cathartica - None known.

USDA Code:

Frangula alnus - FRAL4.

Rhamnus cathartica - RHCA3 (USDA, NRCS 2001).

Legal Status:

Frangula alnus - Not listed.

Rhamnus cathartica - Listed as a noxious weed in IA (USDA, NRCS 2001).

Identification:

Growth Form: Deciduous perennial shrub or tree (Converse 1984).

Flower: Flower is an umbel.

Frangula alnus - Flowers are perfect, five-parted, yellowish green, and occur from May to September. Umbel is sessile.

Rhamnus cathartica - Flowers are dioecious, four-parted, yellowish green, and occur from May to June (Converse 1984).

Seeds/Fruit: Fruits are a drupe.

Frangula alnus - Fruits are reddish to black and occur from July to August. Drupes contain 2 or 3 smooth seeds.

Rhamnus cathartica - Fruits are black and occur from August to September. Drupes contain three or four grooved seeds (Converse 1984).

Leaves:

Frangula alnus - Leaves are alternate, thin, glossy, and obovate to elliptic. Margins are crenulate. Lower leaf surfaces are glabrous to pubescent.

Rhamnus cathartica - Leaves are alternate, dull green, glabrous, and ovate-elliptic. Margins are serrate (Converse 1984).

Stems:

Frangula alnus - Glossy buckthorn can reach heights of up to 7 m. Branches are brownish green, slightly pubescent, and have elongated lenticels.

Rhamnus cathartica - Common buckthorn can reach heights of up to 6 m with trunks up to 25 cm wide. Bark is gray to brown and rough. The inner bark is yellow and the heartwood is pink to orange colored. Twigs are dark gray, glabrous, and have prominent lenticels. Twigs may be tipped with a spine (Converse 1984 and Wieseler 1999).



Frangula flower (John M. Randall/TNC)



Rhamnus fruit (John M. Randall/TNC)



Rhamnus wood (John M. Randall/TNC)



Frangula stem
(John M. Randall/TNC)

Roots: No information available.

Biology/Ecology:

Life Cycle: Both species can reach seed bearing age very quickly. Leaf emergence is early in both species and occurs before most native tree species. Flowers occur after leaves are mature in the spring, with common buckthorn flowers appearing before glossy buckthorn. Seeds are produced in late summer, with fruits remaining on common buckthorn into winter, while glossy buckthorn more readily drops its fruit. Seeds enter a dormant state that either require stratification or scarification, or both (Converse 1984).

Mode of Reproduction: Reproduce by seed only.

Seed Biology: Abundant seed are produced annually by both species, but germination and seed bank information is not available.

Dispersal: Although most seeds end up near the parent plant, the fruits are readily eaten by many birds and mammals, which aids in spreading the seeds (Converse 1984).

Hybridization: No information available.

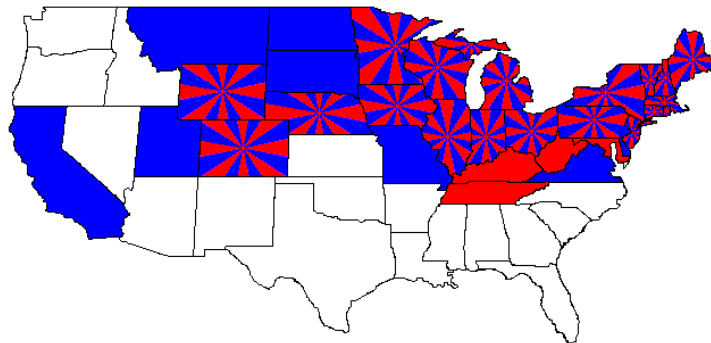
Habitat and Distribution:

General Requirements: Both species occur in open woodlands, prairies, open fields, and roadsides. They can inhabit many different soil types from well to poorly drained and neutral to alkaline soils. *Frangula alnus* typically inhabits sunnier areas and is less shade tolerant than *Rhamnus cathartica* (Converse 1984 and Wieseler 1999).

Distribution: Distribution data obtained from BONAP 2000.

Frangula alnus

Rhamnus cathartica



Similar Species:

Exotics: There are several other species of exotic buckthorns that are generally less widespread and invasive than the two discussed here. *R. davurica* has spine tipped branches and shiny upper leaf surfaces. Other species include *R. japonica* and *R. utilis*.

Natives: Several native buckthorn species resemble the two invasive buckthorns mentioned. *R. alnifolia* is a low shrub less than 1 m tall and has no petals on its flowers. *R. lanceolata* has lanceolate leaves, scaly winter buds, and flowers that appear with the leaves. *R. caroliniana* has umbels with peduncles, acute leaves, and petioles less than 5 mm long (Mohlenbrock 1986).

Impacts:

Agricultural: Buckthorns are alternate hosts for oat rust, *Puccinia coronata* (Converse 1984).

Ecological: Buckthorns form dense thickets that exclude native vegetation. Their light leaf litter also reduces fire frequency (Wieseler 1999).

Human: No information available.

Control:

Biocontrol: No information available.

Mechanical: Mowing is effective at preventing seedling establishment and can be used in open areas. Girdling is effective at killing established buckthorn plants. This involves cutting all the way around the trunk to sever the cambium, the layer of active wood just inside the bark, about 15 cm above ground. This can be performed throughout the winter months (Converse 1984).

Fire: Fire can kill seedlings but results in resprouting from established buckthorns. This resprouting coupled with low litter associated with buckthorn stands limits the usefulness of fire in controlling buckthorns (Wieseler 1999). Stems less than 5 cm in diameter can be killed with a flame torch if it is held in place for 5 seconds to kill the cambium (Converse 1984).

Herbicides: Many different approaches can be used to kill buckthorn with herbicides. First, the cut stump treatment with glyphosate is effective if performed in the fall. Second, glyphosate can also be used in a wick application during the growing season. Frill application (applying herbicide into cuts in the cambium) using picloram or triclopyr during the growing season is effective. Basal bark treatment using triclopyr or 2,4-D on small stems is another useful method (Converse 1984 and Wieseler 1999).

Cultural/Preventive: Perhaps the best method of prevention is to not purchase these species from horticultural suppliers that carry them. There are many native shrubs to be used in wildlife plantings. Another preventative measure is underplanting. Underplanting is planting disturbed areas with native species to prevent the infestation of undesirable ones (Converse 1984 and Wieseler 1999).

Grazing: No information available.

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

References:

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English Ivy
Hedera helix

Family: Araliaceae (USDA, NRCS 2001).
Common Names: English ivy.
Synonyms: None known.
USDA Code: HEHE (USDA, NRCS 2001).
Legal Status: Currently not listed.

Identification:

Growth Form: Evergreen climbing vine (Swearingen and Diedrich 2000).

Flower: Flowers are small, greenish yellow, and occur in the fall. Inflorescence is an umbel (Radford et al 1968).

Seeds/Fruit: Fruit is a black drupe 7-8 mm long that matures in the spring. Seeds are hard and up to 6 mm long (Radford et al 1968 and Swearingen and Diedrich 2000).

Leaves: Leaves are alternate, dark green, waxy, palmately 3-5 lobed, and up to 11 cm long and 10 cm wide (Radford et al 1968 and Swearingen and Diedrich 2000).

Stems: Stems develop rootlike structures that attach to building, trees, etc. by exuding a gluelike substance (Swearingen and Diedrich 2000).

Roots: No information available.



English ivy foliage (J. M. Swearingen/PCA)

Biology/Ecology:

Life Cycle: In warmer areas, English ivy grows year round. In colder climates, it begins actively growing in the spring. Flowering occurs in the fall and the berries ripen in the spring; the berries are then spread by birds and germinate later (Swearingen and Diedrich 2000).

Mode of Reproduction: Reproduces by seeds and vegetatively wherever stems touch the ground (Swearingen and Diedrich 2000).

Seed Biology: No information available.

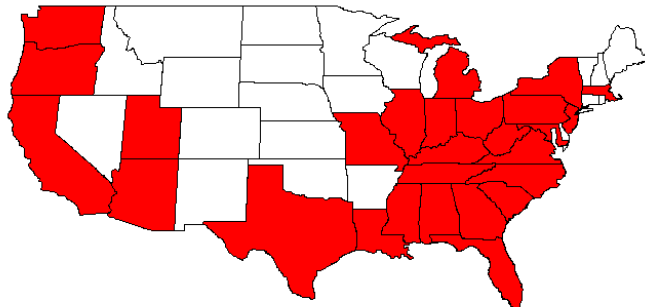
Dispersal: Dispersal of seed is by birds. Plants are very popular ornamental plants and are readily available at most commercial greenhouses and nurseries.

Hybridization: None known.

Habitat and Distribution:

General Requirements: English ivy does not grow well in extremely wet conditions and is drought tolerant. It is generally found in disturbed areas such as woodlands, forest edges, fields, and coastal areas (Swearingen and Diedrich 2000).

Distribution: Distribution data obtained from BONAP 2000.



Similar Species:

Exotics: None known.

Natives: Poison ivy (*Toxicodendron radicans*) is a similar looking climbing vine but has trifoliate leaves while leaves of English ivy are simple.

Impacts:

Agricultural: None known.

Ecological: English ivy is very aggressive and can crowd out native vegetation by forming a thick canopy as a groundcover, or by climbing to the tops of woody vegetation and blocking sunlight and damaging trees with added weight (Swearingen and Diedrich 2000).

Human: English ivy contains glycosides that can cause vomiting, diarrhea, and dermatitis (Swearingen and Diedrich 2000).

Control:

Biocontrol: Currently none.

Mechanical: Cutting or pulling groundcover can be effective but all material must be destroyed or it will reroot. Once English ivy becomes a vine, it is more difficult to control and cutting or pulling alone will not be effective unless foliage is repeatedly destroyed for several seasons (Swearingen and Diedrich 2000).

Fire: No information available.

Herbicides: Triclopyr can be applied as a foliar application, a cut stump treatment, or a basal bark treatment. Care must be taken not to poison desired vegetation as the suckers that attach ivy to trees and shrubs may penetrate their bark. Glyphosate can also be used as a cut stump treatment (Morisawa 1999 and Swearingen and Diedrich 2000).

Cultural/Preventive: Not using English ivy in yards and ornamental plantings will help slow its spread.

Grazing: No information available.

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Privets

Ligustrum amurense, *L. japonicum*, *L. lucidum*, *L. obtusifolium*,
L. ovalifolium, *L. quihoui*, *L. sinense*, *L. vulgare*

Family: Oleaceae (USDA, NRCS 2001).

Common Names:

L. amurense - Amur privet

L. japonicum - Japanese privet

L. lucidum - glossy privet, tree privet

L. obtusifolium - border privet

L. ovalifolium - California privet

L. quihoui - waxyleaf privet

L. sinense - Chinese privet

L. vulgare - common privet, European privet, wild privet (USDA, NRCS 2001).

Synonyms:

L. sinense- *L. villosum* (USDA, NRCS 2001).

USDA Code:

L. amurense - LIAM

L. japonicum - LIJA

L. lucidum - LILU2

L. obtusifolium - LIOB

L. ovalifolium - LIOV

L. quihoui - LIQU2

L. sinense - LISI

L. vulgare- LIVU (USDA, NRCS 2001).

Legal Status: Currently none are listed.

Identification:

Growth Form: Deciduous to evergreen shrubs or small trees (Radford et al 1968).

Flower: Flowers are perfect, white, and usually occur from June to July. Inflorescence is a terminal panicle with petals fused into a tube (Radford et al 1968 and Batcher 2000).



L. obtusifolium fruit (UCONN)



L. amurense flower (UCONN)



Chinese privet foliage and flowers (© J.S. Peterson USDA, NRCS, NPDC)

Seeds/Fruit: Fruit is a blue or black drupe up to 1 cm long containing 1-4 seeds. Fruits ripen from September to October and usually remain on the parent plant throughout the winter (Batcher 2000).

Leaves: Leaves are opposite, thick, simple, entire, and elliptic to ovate. Sizes range from 2-12 cm long with petioles 1 mm to 2 cm long depending on the species (Radford et al 1968 and Batcher 2000).



L. obtusifolium foliage (UCONN)

Stems: Heights are generally to 5 m, exceptin *L. lucidum* and *L. sinense*, which can reach heights of 10 m and 7 m, respectively. Bark is light tan to gray and smooth (Batcher 2000).

Roots: No information available.

Biology/Ecology:

Life Cycle: Privets are either deciduous, semi-evergreen, or evergreen depending on the species and environmental conditions. Flowers are produced in late spring or early summer with seed production following. Seeds mature and

remain on the parent plant throughout winter. They germinate the following spring (Batcher 2000).

Mode of Reproduction: Reproduces by seeds and vegetatively through root suckers (Batcher 2000 and Urbatsch 2000).

Seed Biology: Privets are prolific seed producers and seeds germinate better after passing through the digestive tract of birds. Privets produce a very large seed bank (Kaye and Hoyle 1999 and Urbatsch 2000).

Dispersal: Privets are very popular ornamental shrubs and are very widely used. Birds are the main mechanism of dispersal for the seeds, which allows privets to readily escape horticultural plantings to other areas (Batcher 2000).

Hybridizaton: No information available.

Habitat and Distribution:

General Requirements: Privets prefer sunny, moist habitats, and this is where they will grow the most dense. They are generally found in floodplain forests, fencerows, roadsides, ditches, wetland edges, and mesic upland forests (Batcher 2000 and Langeland and Burks 2000).

Distribution: Distribution data obtained from BONAP 2000.

L. amurense

L. japonicum

L. lucidum

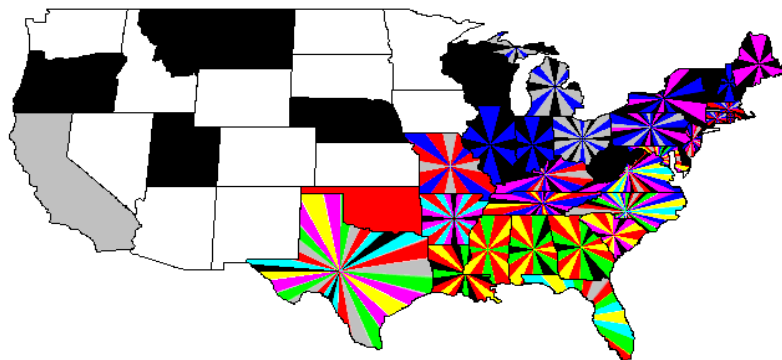
L. obtusifolium

L. ovalifolium

L. quihoui

L. sinense

L. vulgare



Similar Species:

Exotics: None known.

Natives: Native privets (*Foresteria* sp.) have minutely toothed leaves and no petals (Mohlenbrock 1986).

Impacts:

Agricultural: Widely used as a horticultural plant.

Ecological: Privets are able to form dense thickets that outcompete native vegetation.

Human: Fruit can cause nausea, headache, abdominal pain, vomiting, diarrhea, weakness, low blood pressure, and low body temperature if ingested (Urbatsch 2000).

Control:

Biocontrol: Currently none.

Mechanical: Hand pulling is effective for seedling control but the entire root must be pulled to prevent resprouting. Mowing or cutting will prevent the spread of, but will not eradicate privets (Urbatsch 2000).

Fire: Privet litter is generally not very flammable but fire can be effective at controlling Chinese privet if performed annually under the right conditions (Batcher 2000).

Herbicides: For foliar application, glyphosate, triclopyr, and metsulfuron are all effective. For cut stump treatment, glyphosate and triclopyr are effective. Triclopyr can also be used as a basal bark treatment (Batcher 2000).

Cultural/Preventive: Refraining from using privets in ornamental plantings will slow their spread and minimizing disturbances and eradicating small patches will keep infestations from occurring.

Grazing: No information available.

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

References:

Batcher, M.S. 2000. Element Stewardship Abstract for *Ligustrum* spp.. The Nature Conservancy. <http://tncweeds.ucdavis.edu/esadocs.html>.

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Honeysuckle Species

Lonicera fragrantissima, *L. japonica*, *L. maackii*, *L. morrowii*, *L. standishii*, *L. tatarica*

Family: Caprifoliaceae (USDA, NRCS 2001).

Common Names:

L. fragrantissima - January jasmine, sweet breath of spring

L. japonica - Japanese honeysuckle, Chinese honeysuckle

L. maackii - Amur honeysuckle

L. morrowii - Morrow's honeysuckle

L. standishii - Standish's honeysuckle

L. tatarica - Tatarian honeysuckle, bush honeysuckle (USDA, NRCS 2001).

Synonyms:

L. fragrantissima - *Xylosteon fragrantissimum*

L. japonica - *Nintooa japonica*

L. maackii - None

L. morrowii - None

L. standishii - None

L. tatarica - None (USDA, NRCS 2001).

USDA Code:

L. fragrantissima - LOFR

L. japonica - LOJA

L. maackii - LOMA6

L. morrowii - LOMO2

L. standishii - LOST2

L. tatarica - LOTA (USDA, NRCS 2001).

Legal Status: Sale or distribution of Japanese honeysuckle seeds, plants, or plant parts is prohibited in IL (ILCS 1988).

Identification:



L. japonica flower (John M. Randall/TNC)



L. tatarica flower (John M. Randall /TNC)



yellowing honeysuckle flower (John M. Randall /TNC)

Growth Form: *L. japonica* is a perennial woody vine. All others are deciduous shrubs.

Flower: Flowers occur in pairs along the stems borne in axillary peduncles with showy corollas.

L. fragrantissima - Flowers are very fragrant, cream colored with a pink or red tinge, have a two lipped corolla, and usually occur from January to April (Radford et al 1968).

L. japonica - Flowers are white, fading to yellow and usually occur from April to November. The two-lipped corolla is tubular and 3-5 cm long, with the larger lip divided into 3 lobes (Nuzzo 1997 and Batcher and Stiles 2000).

L. maackii - Flowers are white to pink, fading to yellow, 15-20 mm long, and usually occur from May to June (Kay and Hoyle 1999).

L. morrowii - Flowers are white, fading to yellow, pubescent, up to 2 cm long, and usually occur from April to June (Batcher and Stiles 2000).

L. standishii - Flowers are white, fading to yellow, usually occurring from January to April.

L. tatarica - Flowers are white to pink and occasionally crimson, usually occurring from April to June (Batcher and Stiles 2000).

Seeds/Fruit: Fruits are roundish, several-seeded berries up to 1 cm wide, usually red but occasionally orange or yellow, except in Japanese honeysuckle, which has black berries (Williams 1997 and Kay and Hoyle 1999).

Leaves: Leaves are opposite, simple, and entire, except leaves of Japanese honeysuckle are occasionally distinctly lobed.

L. fragrantissima - Leaves are elliptic to obovate, acute, up to 9 cm long and 4.5 cm wide, bristle tipped, and semi-evergreen (Radford et al 1968).

L. japonica - Leaves are ovate, 4-8 cm long, and evergreen in the south (Nuzzo 1997).

L. maackii - Leaves are acuminate, lightly pubescent, and 3.5 to 8.5 cm long (Batcher and Stiles 2000).

L. morrowii - Leaves are elliptic to oblong, 3-6 cm long, and soft pubescent on the lower leaf surfaces (Batcher and Stiles 2000).

L. standishii - No information available.

L. tatarica - Leaves are ovate to oblong, 3-6 cm long, and glabrous (Batcher and Stiles 2000).

Stems:

L. fragrantissima - Stems can reach to 3 m and have multiple stems. Twigs may be hollow and glabrous to bristly pubescent (Radford et al 1968 and Williams 1997).

L. japonica - Stems are trailing or climbing and usually up to 3 m long, although they can reach 10 m. Young stems are reddish to light brown. Old stems are smooth and hollow with brown bark that peels in long strips (Nuzzo 1997).

L. maackii - Stems can reach to 6 m, are multi-stemmed, and older branches can be hollow (Batcher and Stiles 2000).

L. morrowii - Stems can reach up to 2 m, are multi-stemmed, and older branches can be hollow (Batcher and Stiles 2000).

L. standishii - Older stems can be hollow (Williams 1997).

L. tatarica - Stems can reach up to 3 m, are multi-stemmed, and older branches can be hollow (Batcher and Stiles 2000).

Roots: No information available.



fruits (John M. Randall/TNC)

Biology/Ecology:

Life Cycle: Honeysuckles begin growing very early in the season, while most other vegetation is dormant. In some areas, honeysuckles may be evergreen and remain active throughout the winter. Flowers are present early in the spring and seed set soon follows. Seeds mature in summer and fall and are readily dispersed by birds. No information is available about dormancy or seedlings. However, once established, honeysuckles exhibit rapid growth (Nuzzo 1997 and Batcher and Stiles 2000).

Mode of Reproduction: Reproduction is from seeds and from stems rooting at the nodes.

Seed Biology: Honeysuckles are prolific seed producers, and there is speculation of varying dormancy periods, but no information is available on seed bank chronology.

Dispersal: Seeds are spread primarily by birds, which scatter them all over the landscape.

Hybridization: *Lonicera x bella* is a hybrid between *L. morrowii* and *L. tatarica* (Nuzzo 1997).

Habitat and Distribution:

General Requirements: Honeysuckles are generally shade intolerant, but will grow in disturbed forests. They are found primarily in thickets, groves, old fields, fencerows, open woodlands, and along roadsides. They also have a wide range of soil and moisture requirements and can be found in floodplains to dry uplands (Nuzzo 1997 and Williams 1997).

Distribution: Distribution data obtained from BONAP 2000.

L. fragrantissima

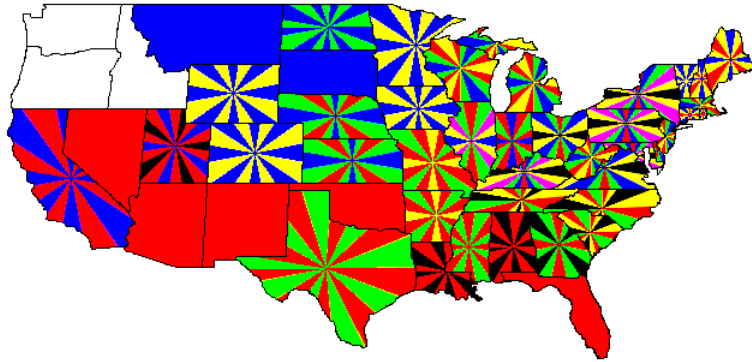
L. japonica

L. maackii

L. Morrowii

L. standishii

L. tatarica



Similar Species:

Exotics: There are several other exotic bush honeysuckles not mentioned that are similar but are not as widespread as those mentioned here.

Natives: Native bush honeysuckles generally have solid stems and shorter growing seasons than the exotics. Additionally, most, if not all exotics have hairy styles, whereas only one native is known to have them: *L. oblongifolia*. Exotic bush honeysuckles have reddish berries and many natives have black or blue berries (Williams 1997 and Batcher and Stiles 2000). Japanese honeysuckle can be distinguished from native honeysuckle vines by looking at its uppermost leaves. They are distinct whereas those of the native species are connate and form a single leaf through which the stem passes. Also, Japanese honeysuckle has black berries while the natives have reddish colored berries (Nuzzo 1997).

Impacts:

Agricultural: None known.

Ecological: Honeysuckles can quickly invade disturbed areas and crowd out native vegetation. They are spread over vast areas by birds and are very aggressive. Further, Japanese honeysuckle can climb up to the top of a forest canopy, blocking sunlight to both the understory and overstory, and causing overstory trees to collapse under the weight of the vines (Nuzzo 1997 and Batcher and Stiles 2000).

Human: No information available.

Control:

Biocontrol: Currently no agents.

Mechanical: Pulling or cutting can be effective if repeated several times a season for several years. In forests that are heavily shaded, pulling or cutting is most effective. Cut pieces must be destroyed because they can sprout, so can any roots that are left in the ground (Nuzzo 1997 and Batcher and Stiles 2000).

Fire: Fire can be used to reduce cover, but will not kill honeysuckles. Following a burn, new shoots are sent up. At this time, herbicides can be used effectively to kill the honeysuckles (Nuzzo 1997 and Batcher and Stiles 2000).

Herbicides: Glyphosate is the most effective and widely used herbicide for honeysuckle control, and can be used in a foliar application or as a cut stump treatment. Treatments will have to be repeated as needed for newly sprouted seeds (Nuzzo 1997 and Batcher and Stiles 2000).

Cultural/Preventive: Avoid using exotic honeysuckles for ornamental or erosion control plantings. Because seeds are so widespread by birds, the best prevention is to keep disturbance to a minimum and

keep natural areas in good quality to prevent establishment. Eradicating small populations as they appear will keep honeysuckles from taking over an area.

Grazing: No information available.

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Mile-a-minute Weed
Polygonum perfoliatum

Family: Polygonaceae (USDA, NRCS 2001).

Common Names: Asiatic tearthumb (USDA, NRCS 2001).

Synonyms: *Ampelygonum perfoliatum* (USDA, NRCS 2001).

USDA Code: POPE10 (USDA, NRCS 2001).

Legal Status: Listed as a noxious weed in NC, OH, and PA (USDA, NRCS 2001).

Identification:

Growth form: Mile-a-minute is an annual vine that can grow 15 cm a day, and extend up to 7 m in length (Haber 1999, and VDCR 2001).

Flower: Clusters of small, closed, white, inconspicuous flowers grow from side branches and have no detectable scent (Haber 1999 and Okay 1999).

Seeds/Fruit: Berry-like fruits are metallic blue, segmented, and 5 mm in diameter, each with a hard, shiny black to reddish-black achene about 2 mm in diameter. Fruits mature around mid-July. A small white elaiosome (food body) is located at the tip of the seed (Haber 1999 and Okay 1999).

Leaves: Thin, triangular, light green leaves are 2-7 cm in width, with barbs located on the underside and on the stalk (Haber 1999). Dead leaves turn reddish brown in winter.

Stems: Thin stems are green or red, covered with rows of spines. Ocreas (saucer-shaped leafy structures, from which flowers emerge) surround the stems at the nodes and at the base of the leaf stalk. (Haber 1999, Okay 1999 and VDCR 2001).

Roots: Mile-a-minute's shallow root system grows rapidly (Haber 1999).



stem showing triangular leaves and ocrea
(J. M. Swearingen/PCA)

Biology/Ecology:

Life cycle: Annual.

Mode of reproduction: Mile-a-minute propagates mainly through seeds; it can self-pollinate.

Seed production: Prolific production of seeds from June until October in Virginia, with a shorter season further north. Seeds germinate from early April to early July (VDCR 2001, Okay 1999).

Seed bank: No information available. Seed dormancy requires further investigation (Haber 1999).

Dispersal: Primarily by birds, rodents, deer, and seed-carrying ants, which are attracted by the elaiosomes (Swearingen 1991). The buoyant fruit and seeds can also be transported via water in creeks, rivers and streams, or during storms (Haber 1999 and Okay 1999).

Hybridization: No information available.

Habitat and Distribution:

General requirements: Mile-a-minute can survive with low moisture and tolerate shade, but prefers direct sunlight (leaf barbs allow this vine to climb and reach higher light intensities) and a high soil moisture level. A vernalization period of at least 8 weeks at a temperature below 10 °C (50 °F) is required to stimulate germination (Haber 1999, Okay 1999, and VDCR 2001).

Distribution: Distribution data obtained from BONAP 2000.



Similar species:

Exotics: Similar to wild buckwheat (*Polygonum convolvulus*), but buckwheat has heart-shaped leaves and mile-a-minute weed has triangular leaves (Radford et al 1968).

Natives: Arrow-vine and halberd-leaved tearthumb are two *Polygonum* species similar to mile-a-minute, except these native species do not have saucer-shaped ocreas at the base of their leaves (VDCR 2001).

Impacts:

Agricultural: Currently, mile-a-minute does not pose a problem to agricultural crops. However, it has the potential to negatively impact cultivated areas such as landscaping, nurseries, horticultural crops, plantations, tree farms, and reforestation sites (Haber 1999, Okay 1999, and VDCR 2001).

Ecological: The vine's climbing growth can expand rapidly over shrubs and trees, forming a dense cover that shades native vegetation. Mile-a-minute also threatens wetland ecosystems (Haber 1999 and VDCR 2001).

Control:

Biocontrol: No known biocontrol agents.

Mechanical: In the early summer, light infestations can be controlled by hand-pulling (before the sharp barbs have hardened—wear gloves and other protective clothing) or digging up plants before seeds mature. Vegetation can be balled up, and dehydrated before burial, burning, or other disposal processes. Frequent monitoring and removal of newly germinated plants is necessary until early July. Other effective methods of control include a regular schedule of mowing and trimming to reduce flowering and fruiting (Haber 1999, Okay 1999, and VDCR 2001).

Fire: No information currently available.

Herbicides: Before seed set (early August), spot application of glyphosate is suggested for control in heavily infested areas, but caution should be used because this herbicide will also kill native vegetation. Herbicidal soaps can be used to burn the foliage, but treatment must be repeated to treat regrowth throughout the season (Haber 1999, Okay 1999, and VDCR 2001).

Cultural/Preventative: Invasions of mile-a-minute can be discouraged by maintaining native plant communities and limiting breaks in vegetation. Along forest edges and waterways, vegetative buffers could also discourage growth and reduce dispersal (Okay 1999). Monitoring for mile-a-minute in or around sensitive natural areas is recommended.

Note of Caution: By law, herbicides may only be applied accg to label directions and by licensed herbicide applicators or operators when working on public properties. Always follow herbicide label directions and precautions. Protective clothing and gloves should be worn to protect against sharp barbs (Okay 1999).

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Kudzu

Pueraria montana

Family: Fabaceae (USDA, NRCS 2001).

Common Names: Kudzu.

Synonyms: *Dolichos lobatus*, *Pueraria hirsuta*, *Pueraria lobata*, *Pueraria thunbergiana* (USDA, NRCS 2001).

USDA Code: PUMOL (USDA, NRCS 2001).

Legal Status: Listed as a noxious weed and seed in KS and a noxious weed in FL, MO, OR, PA, and WV. It is also federally listed noxious weed (USDA 2001 and USDA, NRCS 2001).



typical kudzu infestation (John M. Randall/TNC)

Identification:

Growth Form: Deciduous, woody, perennial vine (Bergmann and Swearingen 1997).

Flower: Flowers are purple, pea-like, 2-2.5 cm long, very fragrant, and borne on long racemes up to 20 cm long. Flowering usually occurs from June to September (Bergmann and Swearingen 1997, Kay and Hoyle 1999, and Langeland and Burks 2000).

Seeds/Fruit: Fruit is a legume up to 8-cm long that is densely covered with long golden-brown hairs. Pod is flat, bulges over the seeds, and holds between three and ten seeds (Radford et al. 1968, Bergmann and Swearingen 1997, and Langeland and Burks 2000).

Leaves: Leaves are alternate, trifoliate, dark green, pubescent, up to 15 cm long, and have long petioles. Leaflets may be unequal and entire or 1-3 lobed (Bergmann and Swearingen 1997, and Langeland and Burks 2000).



kudzu leaf (J. M. Swearingen/PCA)



kudzu flower and leaf
(William S. Justice/PLANTS)

Stems: Stems are rope-like and dark brown, reaching lengths up to 30 m. Young stems are noticeably hairy (Radford et al. 1968 and Langeland and Burks 2000).

Roots: Roots are massive, and can support up to 30 vines from a single taproot. Taproots can reach widths of 18 cm and depths of over 2 m (Bergmann and Swearingen 1997).

Biology/Ecology:

Life Cycle: Flowering usually does not occur annually in kudzu and only occurs on plants in full sun. Seeds that are produced have low viability. Reproduction usually occurs vegetatively from rooting at the stem nodes, which will enlarge to produce a new taproot and crown. Plants grow actively from late spring until the first frost. Frost can kill smaller vines less than 1 cm in diameter, but growth will resume from the crown in spring (MODOC 2001, SEEPPC 2001, and VDCR 2001).

Mode of Reproduction: Although seeds are produced, few of them are viable. The major form of reproduction is through rooting where stem nodes touch the ground and through spreading rhizomes (SEPPPC 2001).

Seed Biology: Seed viability is quite low. It is speculated that viable seeds can survive for several years (VDCR 2001).

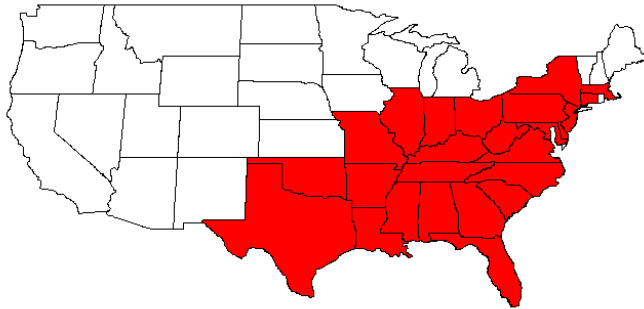
Dispersal: Dispersal is probably due to birds, water, and human activities.

Hybridization: None known.

Habitat and Distribution:

General Requirements: Kudzu grows best in sunny areas with hot, moist summers and mild winters. It is usually found in forest openings and edges, roadsides, old fields, and other disturbed areas (Bergmann and Swearingen 1997).

Distribution: Distribution data obtained from BONAP 2000.



Similar Species:

Exotics: None known.

Natives: Kudzu can be confused with the trifoliate species of *Desmodium*, which do not reach the magnitude of kudzu. *Desmodium rotundifolium* is a trailing legume that reaches lengths of 1.5 m and is never woody. Kudzu leaves may also be confused with poison ivy (*Toxicodendron radicans*), but kudzu stems and leaves are visibly more hairy (MODOC 2001).

Impacts:

Agricultural: Kudzu can invade fields and pastures, making hay and crop production difficult due to their aggressive spreading and thick vines. Additionally, kudzu can devastate timber production by forming a canopy over the forest canopy, girdling trees, and breaking and uprooting trees from the weight of the vines (VDCR 2001 and Bergmann and Swearingen 1997).

Ecological: Kudzu is very aggressive and can crowd out or smother native vegetation. It can kill trees and shrubs by blocking out sunlight and by breaking them with their weight, as well as shading out any understory vegetation (Bergmann and Swearingen 1997).

Human: Kudzu can cause electrical disruptions by climbing up utility lines and breaking them, and can cause structural damage to homes and buildings.

Control:

Biocontrol: None currently.

Mechanical: For cutting or mowing to be effective, it must be repeated every month for at least two growing seasons. It will keep the plants from spreading if the cut pieces are burned or properly disposed of (Bergmann and Swearingen 1997).

Fire: Burning will only result in resprouting (MODOC 2001).

Herbicides: Glyphosate and triclopyr can be used to treat cut stumps, as a foliar application, or applied to cuts in the root crown (SEPPPC 2001).

Cultural/Preventive: Coordinating with local landowners to wipe out large infestations is the only way to prevent repeated infestations.

Grazing: Grazing is quite effective since kudzu is readily grazed by most livestock. Three to 4 years of intensive grazing can eliminate kudzu infestations. This is only effective where livestock can reach the vines. Vines out of reach will have to be cut and fed to livestock because 80% of the kudzu foliage must be continually removed for adequate control (MODOC 2001).

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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Multiflora rose
Rosa multiflora

Family: Rosaceae (USDA, NRCS 2001).

Common Names: Multiflora rose.

Synonyms: *Rosa cathayensis* (USDA, NRCS 2001).

USDA Code: ROMU (USDA, NRCS 2001).

Legal Status: Listed as a noxious weed and seed in PA and a noxious weed in IN, IA, MO, SD, VA, WV, and WI. It is also prohibited for sale and distribution in IL under the Illinois Exotic Weed Act (ILCS 1996, USDA 2001, and USDA, NRCS 2001).

Identification:

Growth form: Perennial, thorny, deciduous shrub (VDCR 2001).

Flower: Flowers are white or pink, usually occurring from May to July. Inflorescence is a panicle 8-15 cm long, with up to 30 flowers. Flowers have 5 petals and a 5-lobed calyx (Butterfield et al. 1996).

Seeds/Fruit: Fruit is an achene that is enclosed in a red hypanthium; it is called a rose hip. Hips are up to 8.5 mm long and 8 mm wide. Achenes are flattened, oval, and yellowish to tan colored (Butterfield et al. 1996).



flowers (UCONN)



canes with hips (UCONN)

Leaves: Leaves are alternate, odd-pinnately compound with 5-11 leaflets, up to 11 cm long, with ovate to oblong, serrated leaflets up to 5.5 cm long. Petioles are subtended by a pair of fringed bracts (Butterfield et al. 1996 and Bergmann and Swearingen 1997).



odd-pinnate foliage (UCONN)

Stems: Stems (canes) are highly branched, few to numerous, covered with thorns, and up to 3 m long, and can be arching or trailing. Twigs are red to green and smooth, and the bark is smooth and gray or brown (Butterfield et al. 1996).

Roots: Roots are deep rooted and can form from canes that touch the ground (Butterfield et al. 1996 and Bergmann and Swearingen 1997).

Biology/Ecology:

Life Cycle: Plants are deciduous and resume growth every spring. Flowers are produced in late spring and seed production follows. Fruits remain on the plant throughout the winter and are eaten by birds. Seed germination is enhanced by stratification and by scarification in the digestive tracts of birds. Seeds can

begin germinating in less than 2 months and grows as an inconspicuous trailing stem for the first 1 or 2 years (Butterfield et al. 1996 and Bergmann and Swearingen 1997).

Mode of Reproduction: Reproduces by seed and by rooting canes that touch the ground (Bergmann and Swearingen 1997).

Seed Biology: Seed production is enormous, with individual plants capable of producing a million seeds every year. Germination is enhanced by stratification for 60 days and by scarification from birds (Bergmann and Swearingen 1997).

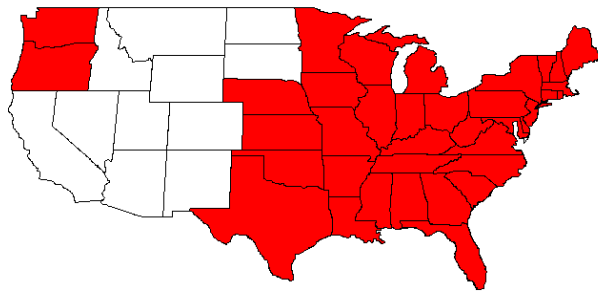
Dispersal: Primary dispersal is from birds (Bergmann and Swearingen 1997).

Hybridization: None known.

Habitat and Distribution:

General Requirements: Multiflora rose can tolerate a wide range of environmental conditions, including shade to full sun, wet or dry sites, and clay pans to gravel. It is generally found in prairies, pastures, fields, roadsides, forests, open woodlands, and riparian zones (Eckhardt 1987, Butterfield et al. 1996, and Bergmann and Swearingen 1997).

Distribution: Distribution data obtained from BONAP 2000.



Similar Species:

Exotics: *Rosa bracteata* is less widespread and has leaves 1-3 cm long and up to 2 cm wide, sepals up to 2 cm long, white petals up to 3.5 cm long, and black hips. Multiflora rose has leaves up to 6 cm long and 3 cm wide, sepals up to 7 mm long, white or pink petals up to 1.5 cm long, and red hips (Radford et al. 1968).

Natives: *Rosa setigera*, prairie rose, has trifoliate leaves and a pink or rose flower. Multiflora rose has an odd-pinnate leaf with 5-11 leaflets and mainly white flowers (Radford et al. 1968).

Impacts:

Agricultural: Multiflora rose can form impenetrable barriers to livestock, preventing grazing (Bergmann and Swearingen 1997).

Ecological: Multiflora rose is a prolific seed producer and readily invades numerous habitats, forming impenetrable thickets and outcompeting native species (Bergmann and Swearingen 1997).

Human: Thorns can be painful to touch (personal observation).

Control:

Biocontrol: A native fungal disease, rose-rosette disease, that is spread by a mite, can eliminate large stands of multiflora rose. It is native to the western United States but has been steadily migrating eastward, probably aided by the prevalence of multiflora rose. Another potential control agent is the European rose chalcid, *Megastigmus aculeatus*, a tiny wasp whose larvae eat the seeds. Both of these control agents have drawbacks, however, as they are not host specific and will attack native and commercial rose plants (Eckhardt 1987 and Bergmann and Swearingen 1997).

Mechanical: Repeated cutting or mowing three to six times per growing season for 2 to 4 years is effective at killing multiflora rose (Bergmann and Swearingen 1997).

Fire: No information available.

Herbicides: Glyphosate can be used very effectively as a cut stump treatment and as a foliar application. Other effective foliar applications are 2,4,5-T, 2,4-D, picloram, dicamba, triclopyr, and fosamine (Bergmann and Swearingen 1997).

Cultural/Preventative: Minimizing disturbance is the best way to prevent infestation.

Grazing: Sheep and goats will eat multiflora rose, but must be grazed intensively for several seasons to be effective.

Note of Caution: By law, herbicides may only be applied according to label directions and by licensed herbicide applicators or operators when working on public properties.

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